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EDWARD SOMERSET, SECOND MARQUIS OF WORCESTER.

AN EXACT REPRINT
OF THE FAMOUS
Century of Inventions.

OF

THE MARQUIS OF WORCESTER. *E Son*
(First Published in 1663.)

WITH

INTRODUCTION, NOTES AND A LIFE OF THE AUTHOR,

BY

JOHN PHIN.

WITH PORTRAIT AFTER A PAINTING BY VANDYKE.

NEW YORK:
THE INDUSTRIAL PUBLICATION COMPANY.

1887.

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PREFACE.

Our object in reprinting the famous "CENTURY OF INVENTIONS," as it is generally called, is not to give any novel solutions of the problems which it sets forth, but simply to place this famous and exceedingly interesting production within the reach of ordinary book-buyers. Although it has been several times reprinted, it is so scarce that copies are to be had only with considerable difficulty. Of the first edition, published in 1663, very few copies are to be found outside the shelves of a few well-known public libraries. It is said that this is largely due to the fact that all the copies that were procurable were bought up and burned by a rival inventor (Savary), who claimed to be the first inventor of the steam engine. Of subsequent reprints it will be found on inquiry that they have been so much sought after and read that they have been literally "thumbed out of existence," as the genial author of "The Book Hunter" expresses it in regard to similarly popular books.

Under these circumstances it is to be hoped that our present offering will prove acceptable to a large number of those who are interested in the history of inventions and of mechanics.

J. P.

Cedar Brae,

October, 1887.



LIFE
OF
EDWARD SOMERSET,
SECOND MARQUIS OF WORCESTER.

Edward Somerset alias Plantagenet,* Second Marquis of Worcester, like many of the wisest and best of this earth — nay, like the wisest and best—bore on his escutcheon the Baston Sinister. He was descended from John of Gaunt, Duke of Lancaster, son of Edward the Third. Charles, the natural son of Henry Beaufort, third Duke of Somerset, in that line, assumed the surname of Somerset, and from him was descended the famous author of “The Century of Inventions,” who was the eldest son of Henry Lord Herbert and Anne, sole daughter and heir of John Lord Russell, eldest son of Francis Russell, Earl of Bedford. He was born

* See Patent granted by Charles the First on the 1st of April, 1644: “Charles, by the Grace of God, King of England, Scotland, France and Ireland, defender of the faith, etc., to our right trusty and right well beloved cousin, Edward Somerset alias Plantagenet, Lord Herbert, Baron Beaufort, of Caldicote, Grismond, Chepstow, Ragland and Gower, Earl of Glamorgan, son and heir apparent of our entirely beloved cousin, Henry, Earl and Marquis of Worcester, greeting.” Etc., etc., etc.

early in 1601 the exact date being unknown. During his father's life-time he was known first as Lord Herbert, and afterwards as Earl of Glamorgan. On the death of his father he succeeded to the titles of Earl and Marquis of Worcester.

His education appears to have been conducted privately under the tutorship of a Mr. Adams. It does not appear that he was entered at any of the great English colleges, though it is possible that he may have been connected with some foreign university. Be this as it may, it is quite certain that his education was as complete and thorough as that of any young man of his time.

In the year 1628 he married Elizabeth, daughter of Sir William Dormer. She bore him one son and two daughters. The son, Henry Somerset, was created first Duke of Beaufort.

It is supposed that shortly after his marriage he retired to Raglan Castle and devoted himself to study and experiment, but of this we have no record.

In the year 1635 (May 31st) he lost his wife, to whom he was greatly attached. Four years later he married Margaret, second daughter of Henry O'Brien, Earl of Thomond. He obtained by his second wife some valuable possessions, and he also became connected with some of the most wealthy and powerful families in Ireland. By his second wife he had one daughter who died while quite young.

It is an unfortunate circumstance that we know very little of the daily life of the Marquis at this period, and nothing at

all of his pursuits, studies and inventions, except in a most general way. Even the exact dates of important events in his life are unknown, and the length of time during which he was imprisoned in the Tower is a matter of conjecture. That he continued his scientific and mechanical pursuits even during the early tumults of the civil war is pretty certain, and that some of his inventions were put in operation, at Raglan Castle, on a scale of considerable magnitude, seems more than probable from the following anecdote related by Dr. Bayly: "At the beginning of this Parliament (Nov. 1640) there were certain rustics who came into Raglan Castle to search for arms, his lordship* being a Papist. The Marquis met them at the castle gate, desiring to know whether they came to take away his money, seeing they intended to disarm him. They stated that they made the application merely in consequence of his being a recusant. To which he replied, 'He was a peer of the realm, and no convict recusant, therefore the law could not in reason take notice of any such things.' Finding some sharp and dubious expressions coming from the Marquis, they were at last willing to take his word; but he, not willing to part with them on such easy terms, had before resolved to return them one fright for another. With that view he conveyed them up and down the castle, until at length he brought them over a high bridge that arched over the moat that was between the castle and the great tower, wherein the Lord Herbert had newly con-

* The father of the famous Marquis.

trived certain water-works, which, when the several engines and wheels were to be set a-going, much quantity of water, through the hollow conveyances of the aqueducts, was to be let down from the top of the high tower; which, upon the first entrance of these wonderful asinegoes, the Marquis had given order that these cataracts should begin to fall, which made such a fearful and hideous noise, by reason of the hollowness of the tower, and neighboring echoes of the castle, and the waters that were between, and round about, that there was such a roaring as if the mouth of hell had been wide open, and all the devils conjured up, occasioning the poor silly men to stand so amazed as if they had been half dead; and yet they saw nothing. At last, as the plot was laid, up came a man staring and running, crying out '*Look to yourselves my masters, for the lions are got loose.*' Whereupon the searchers tumbled so over one another escaping down the stairs, that it was thought one half of them would break their necks, never looking behind them until out of sight of the castle."

'Troublous times were now approaching. Charles the First was in sore need of money, and Lord Herbert and his father advanced him large loans from their personal estate. In addition to this they raised and sustained a considerable body of troops. Up to this time the highest dignity attained by the family was that of Earl of Worcester. On the 2nd of November, 1642, Henry, (the father of the famous Edward) was created Marquis of Worcester. The civil war now raged, and Raglan Castle was garrisoned by troops

maintained by the Somersets in the interest of the King. The scientific and mechanical skill of Lord Herbert, (the future Marquis) were here brought into play, and a powder mill was erected on the estate and actively operated for the supply of ammunition to the royal troops.

As a military man, however, Lord Herbert does not seem to have achieved much success. His troops were defeated by the Parliamentary forces, and his pecuniary losses were so enormous that he was made a poor man for the rest of his life.

In 1645 he was sent to Ireland by the King with a commission to raise a body of 10,000 Irish troops for service in England to oppose the parliamentary forces. To secure the aid of the Catholics in this effort, Lord Herbert, recently created Earl of Glamorgan, was empowered to offer the Romish dignitaries the most liberal terms, not only as regarded toleration, but in the matter of lands, titles, etc., to be placed in their possession. This arrangement was, however, completely upset by certain wholly unlooked for events. The Popish Archbishop of Tuam, President of Connaught, and one of the Supreme Council at Kilkenny, going into Ulster to visit his diocese, and put into execution an order for arrears of his Bishopric, granted to him by that Council, met with a body of Irish troops marching to besiege Sligo, and joined with them. When they came near that town, the garrison made a sally on the 17th of October, charged the troops, and utterly routed them, killing the Archbishop in the encounter. Amongst the baggage of the Archbishop was

found an authentic copy, attested and signed by several bishops, of the treaty concluded with them by the Earl of Glamorgan. The result of this disclosure was that Lord Digby charged the Earl with suspicion of high treason, and moved that his person be secured. The charge being fully substantiated, the Earl was committed to the custody of the Constable of Dublin Castle in the condition of a close prisoner. After a brief confinement he was liberated on bail, but under the condition that he should not leave the Kingdom of Ireland.

Meanwhile Raglan Castle, the family seat and the scene of his early studies and experiments, was taken by General Fairfax after a prolonged seige. The letters and papers were carried off and the castle ordered to be demolished. It is probable that in the dispersion and destruction of these papers we have lost the records of many of the early experiments and inventions made by the Marquis.

These accumulated misfortunes no doubt hastened the death of his father, which occurred in December, 1646.

Very soon after these events matters were so arranged that he was enabled to go to France, where he remained in exile for four or five years. That some arrangement looking to his voluntary exile was made with the government is more than probable, as the Marquis was too honorable to leave in the lurch his friends, the Marquis of Clanricarde and the Earl of Kildare, who were on his bond for ten thousand pounds each.

On the 30th of January, 1649, Charles the First was exe-

cuted; the commonwealth was established on the 6th of February following, and the Protectorate under Cromwell in 1654. Meanwhile Charles the Second had escaped to the continent and set up a migratory court. Although the Marquis was not a constant attendant at this court, he appears to have been in communication with them, and in 1652 he was sent to England for private intelligence as well as for supplies. Unfortunately, however, he was recognized, made prisoner, and committed to the tower, where he remained for a period variously estimated at from two to six years. During his confinement he wrote the famous book known as "A Century of Inventions," which, however, was not published until 1663, though it was supposed that several manuscript copies were made and circulated amongst his friends. One of these is now in the British Museum, and is interesting on account of certain slight variations from the printed book.

In 1660 Charles the Second returned to England and was placed upon the throne of his fathers. One would suppose that a man who had suffered so much in attestation of his loyalty would have been most liberally treated, but we find that, although the estates of the Marquis were restored, they were heavily encumbered and greatly despoiled. The timber had been removed, the buildings were in ruins, and the sources of income were but trifling. He therefore took up his residence in London, where, in the hopes of retrieving his fortune, he devoted himself to the prosecution of his studies

and the perfecting of his inventions, though it would seem without any very marked financial success.

Four years after the publication of the "Century"—on the 3rd of April, 1667—he died in London, and on the 19th of the same month he was buried in the family vault within the Parish Church of Raglan.

Such is a meagre outline of the life of the Marquis of Worcester. Those who desire to follow out the details of his political relations more closely will find much material in the Life by Henry Dircks—a crude and ill-digested performance, which should be called a collection of materials for a biography, rather than a biography.

That the Marquis of Worcester was a keen student and an enthusiastic inventor, there can be no doubt. That the results which he attained have been greatly over-estimated is very certain, but the wonder is that he should have accomplished anything at all when we consider the troublous times in which his lot was cast.

As a man he was loyal, brave and honest, qualities not always found in high places in those days. Unfortunately, for himself, he was, during a great part of his life, attached to the losing side, and when the tide of success turned he was too old to secure the favor of such a frivolous and sensual monarch as Charles the Second.

INTRODUCTION.

If we except those who have taken an active controversial part in religion or politics there is no man in regard to whom such positively opposite opinions have been entertained, as the Marquis of Worcester. Dircks, in the Dedication prefixed to his *Life of the Marquis*, affirms that it would be "impossible to name his compeer either amongst the highest nobility or the most eminent scientific celebrities of Europe, during the last two centuries." In other words, Newton, Davy, Faraday, Watt, Stephenson, and all the other stars in the bright galaxy which stretches across the last two hundred years, pale before the effulgence of the fame of the Marquis of Worcester!! On the other hand Walpole speaks of the "*Century of Inventions*" as "an amazing piece of folly," and rates the author as little better than a madman! It is pretty certain that the truth lies between these two extremes, for the one is the conclusion of a man of trinkets and trifles who never in his life grappled with a serious subject and conquered it, and the other is the outcome of mere toadyism on the part of a man who evidently wished to ingratiate himself with certain aristocratic families.

Unfortunately, for the Marquis, the labors of Mr. Dircks

have rendered certain the fact that to him we owe absolutely nothing so far as inventive progress is concerned. He may have constructed steam engines more perfect than those turned out by the best factories of the present day; he may have perfected inventions, which, if now understood, would render both telegraph and telephone useless, and his "Water-Commanding Engine" may have been not only "Semi-omnipotent" but actually *omnipotent*, and yet it is no injustice to him and no ingratitude on our part for us to say that we owe him NOTHING, for with all the efforts of Mr. Dircks and all the facilities placed at his command, as regards old papers, records, models, etc., there has not been brought to light one scrap of writing, or one fragment of a model, that tends to show that the Marquis ever developed a successful invention or that he ever carried one to such a degree of completion as would enable a modern mechanic to profit to any extent by his labors.

It is therefore very obvious that we owe none of our mechanical or inventive progress to him. Whether he actually succeeded in perfecting the inventions that he describes, and especially, whether or not he was the real inventor of the steam engine, are questions which will be attacked by those who desire to gratify their antiquarian curiosity, but not by those who desire to render to the name of a benefactor the homage which gratitude prompts.

Many of the inventions described by the Marquis are frivolous and useless. He gives no clue to his ciphers, but it is the simplest of all tasks to devise methods which will con-

form to all the conditions stated in his book; the only difficulty is that in these days the deciphering of cryptographs has made such progress that any such ciphers would be useless. A mere tyro in the art would be able to decipher them and in a few minutes force them to give up their true meaning.

That many of the alleged inventions described in the Century were solved only in the imagination of the Marquis can hardly be doubted by any intelligent student. For example, No. 56 is a very perfect description of a common form of so-called perpetual motion—that is to say, it is one of those forms which are almost certain to occur to every active mechanical mind that attempts to solve this famous problem. We have known it to be invented a dozen times by persons whose efforts and ideas were entirely independent of each other, and who had never heard of the thing before. We have had models of this contrivance brought to us, and so strong was the hold that the theoretical idea had taken upon the minds of the inventors that although in every case the models failed to operate yet this was invariably attributed to the mechanical defects and rude workmanship of the model and not to any fallacy lurking in the theory. And every editor of a popular scientific journal and every person having much to do with inventors, will no doubt testify to the same experience.

It is a fact well known to all who are actually brought into contact with mechanical progress that the inventive world is full of embryo inventions whose maturity is an im-

possibility. At one time our Patent Office required models of all inventions capable of being so illustrated. As a general rule the office accepted what were called "dummy" models—that is to say, models that merely showed the form and arrangement of the parts without actually working. In particular cases the office had the power to demand "working" models, but these were not often required. Now every patent agent will testify that the percentage of inventions which seemed feasible in drawings and dummy models and yet failed in actual practice was very large. And, so plausible did these schemes seem that the authors would have had no hesitation in risking their lives on the results; far less would they have hesitated to describe them as "inventions which they had tried and perfected." So that we are far from impugning the veracity of the Marquis when we say that many of these things existed only in his imagination, for it must be borne in mind that every inventor is gifted with a vivid imagination; indeed, if defective in this respect, he never could be an inventor.

Those who will carefully study the inventions described in the "Century" will be surprised to see how many of them have been brought to a degree of perfection of which the Marquis could have had no idea. Not only has the power of steam been so developed that the claims of the Marquis have been far exceeded, but our telegraphs, telephones, armored ships, land turrets and other contrivances throw far in the shade anything ever conceived or named by him. But, when we read his wonderful descriptions we

cannot but accord to him a power of vision far in advance of his day. He had a marvellous insight into the future, and unbounded faith in the possibilities of science and mechanics, and the probability is that if he had closely settled down to the hard work of thorough investigation, and the prosaic study of facts and principles, he would have been the real inventor of the modern steam engine. But not only did he fall upon evil times, his mind was too enthusiastic and flighty for such work, and he spread over a "Century" of inventions that power which he ought to have confined to one or two.

Amongst the questions which always occur when the name of the Marquis of Worcester is brought forward, are those relating to the invention of the steam engine. Prof. Robison and some others broadly claim that he was the inventor of this modern aid to civilization, while Arago claims the like for De Caus, others claim it for Savery, and the friends of other inventors make like claims. The thoughtful student will see that none of these claims are well founded. The development of the Steam Engine was a gradual process, proceeding in some cases along distinct and unconnected lines, which in every case served to develop some useful principle, but which did not always produce a practical result, capable of utilization in the modern machine.

The principal stages of this course of invention seem to have been the following:

1. The discovery of the expansive force of steam.
2. Its direct application to the production of mechanical motion.

3. Its direct application to the raising of water in closed vessels.

4. Its use in the formation of a vacuum so as to produce mechanical motion.

5. Its application to the direct movement of a piston in both directions.

At every one of these stages various minor improvements were made, any one of which would, if not superseded by better, have made the fame and fortune of any inventor, but to no one inventor do we owe our advancement through more than one stage. Let us briefly glance at these several stages.

The expansive power of steam was no doubt discovered at a very early period in the history of man's progress. Indeed, it is quite certain that it antedates many of our well-defined historic periods, such as the bronze and iron ages. It was probably discovered as soon as men had constructed rude vessels of earthen ware in which they could cook their food. The lids of these vessels would often be raised by steam; explosions of pent-up vapor would occur, and even in the infancy of the arts, men would be taught to respect the tremendous power which now does us such noble service.

We can easily imagine the consternation of the ancients at some of these tremendous manifestations, and we can easily suppose that they would be attributed to the working of some Genie or Spirit, for all the invisible forces were so regarded by men in early times. Our modern word *gas* is

nothing but the word *ghost* in a different form, and it came to be applied to invisible airs, because these were supposed to be subterranean spirits. So the name of the metal *Cobalt* is merely a transformation of the word *Kobold*, the name of an evil spirit who was supposed to haunt mines, and change good metal to worthless alloy. In the hands of the ancient priests, steam played an important part in many Pagan ceremonies, and therefore we may safely conclude that this stage of the discovery of steam as a source of power antedates all history.

The same is true of the second stage. In his work entitled "Spiritalia," Hero, of Alexandria, describes three modes in which steam might be employed as a mechanical power: 1, to raise water by its elasticity; 2, to elevate a weight by its expansive force, and 3, to produce a rotary motion by its reaction in escaping from the side of a tube. The latter works on the same principle that operates the well-known Barker's water-mill. Hero does not claim these inventions as his own, but, as has been well said, "though posterity is really not indebted to him for the invention, it is still more beholden to him for the bequest of his description, than if he had been the inventor and had omitted to describe it." The invention of Branca, and also the well known modification of Branca's device, in which a jet of steam is made to act directly on the buckets or vanes of a breast-wheel, come under this head.

In the third stage we find steam used in close vessels and pressing directly upon the water to be raised. This was a

direct step in advance, though in some of its forms it was no doubt invented at a very early period. The crudest form of the device is that of which the so-called engine of De Caus is an illustration. In this "engine" the entire body of water to be raised must first be heated above the boiling point—an arrangement which is utterly impracticable so far as any useful *mechanical* purpose is concerned. This device is, however, very old—much older than De Caus.

It would of course soon be found that it was not necessary to heat the water to be raised; that steam from a separate boiler would be much more economical. This method was fully described by Porta in 1601, and is still in use in a simple and tolerably efficient form of water-raising engine.

The fact that when steam is condensed by cold, a vacuum is formed, was well known in very ancient times. The old steam blowers or Eolipiles were frequently filled by utilizing this principle, and it was not a great step from the mere raising of water into an Eolipile to the raising of a weight by the use of a piston. Pistons for raising water antedate any recorded form of the steam engine, and their adaptation to the production of mechanical movements by the pressure of the atmosphere, did not require any great stretch of the inventive faculty.

The fifth stage in which steam was caused to act directly on a piston, was the culmination of the invention of the steam engine. An infinite number of modifications, and of additional devices and improvements may have been added, but this was the fundamental idea the adoption of which brought success.

To which of these stages the inventions of the Marquis belonged we have no means of knowing. There is not a scrap of drawing, a fragment of a model, or an intelligible description remaining to aid us on this point. True, we have many sketches, and so-called restorations, but they are all the products of the fancy and the inventive powers of biographers and commentators.

As regards the engine at Vauxhall, it may, for aught we know, have been a mere pump. Two very intelligent travellers visited the works at times considerably apart, and both speak of the use of horses for driving the engines. A steam engine, worked by horses, is certainly a curious invention.

Historians have indulged in much speculation as to the causes which delayed the invention of the steam engine to so late a period. It is acknowledged on all hands that the properties and powers of steam were tolerably well understood, and all the mechanical elements of a successful engine had been invented—the crank, the piston, etc. And the mechanical skill of the ancients has furnished a subject for many a lecturer on the “lost arts.” Why then was not the steam engine produced? Simply because it was not needed. What would have been the use of a motive power to a people who had no machinery for it to drive? The Greeks and Romans had not even a threshing machine, far less spinning machinery, power looms, or rolling mills. All their mechanical work was done by hand-power, and so long as the spinning wheel was turned by women and the shuttle driven by men, of what use could a steam engine have been to them?

In the history of the arts, and sciences we find that the progress of each depends greatly upon that of the others. Astronomy and physiology came to a standstill until the science and practice of optics were so improved as to place the telescope, the spectroscope and the microscope at their command. Since then the progress made in these departments has been simply marvellous. In the arts we find that every new demand gives rise to new inventions and new discoveries. As soon as the English mines required power of some kind to keep them free from water, pumps suited to the purpose were invented. At first these pumps were worked by hand, but as soon as greater power became necessary new inventions were made and horse-power was applied. This enabled the mines to be carried to a greater depth, and then a still more powerful motor was needed, and as soon as this became apparent the steam engine was invented.

In the arts as in daily life, the extent of our wants is the measure of our civilization.

NOTE.

In the following pages we give a verbatim reprint of the Edition of 1663—the only one known to have been published during the life of the Marquis.

There is in the British Museum (Harleian MS. No. 2428) a manuscript copy of the *Century*. Partington affirms that this copy is in the handwriting of the Marquis, but such is not the case. It is evidently a mere copy made by some one for his own convenience before the work was printed. The top of the title page of the MS. copy bears the words “from August ye 29th to Sept. ye 21st, 1659” This is supposed to indicate the time occupied in copying it.

The MS. copy differs in several places from the printed edition. These variations we have given in foot notes, so that the reader may have the exact text of both the printed and the written copy.

In the MS. copy, however, No. 88 instead of being a description of a Brazen Head, is a description of “A Stamping Engine” for coining money. The description is as follows:—“An engine without ye least noyse, knock or use of fyre, to coyne and stamp 100 lb. in an houre by one man.”



A
CENTURY
OF THE
Names and Scantlings
OF SUCH
INVENTIONS,

As at present I can call to mind to have tried and perfected, which (my former Notes being lost) I have, at the instance of a powerful Friend, endeavoured now in the Year 1655, to set these down in such a way as may sufficiently instruct me to put any of them in practice.

—— *Artis & Naturæ proles.*

L O N D O N :

Printed by *J. Grismond* in the year 1663.

TO THE
KINGS

Most Excellent MAJESTY.

SIR,

SCIRE meum nihil est, nisi me scire hoc sciat alter, saith the poet, and I most justly in order to Your Majesty, whose satisfaction is my happiness, and whom to serve is my onely aime, placing therein my Summum bonum in this world: Be therefore pleased to cast Your gracious Eye over this Summary Collection, and then to pick and choose. I confess, I made it but for the superficial satisfaction of a friends curiosity, according as it is set downe; and if it might now serve to give aime to Your Majesty how to make use of my poor Endeavours, it would crowne my thoughts, who am neither covetous nor ambitious, but of deserving Your Majesties favour upon my own cost and charges; yet, according to the old English Proverb, It is a poor Dog not worth whistleing after. Let but Your Majesty approve, and I will effectually perform to the height of my Undertaking: Vouchsafe but to command, and with my Life and Fortune I shall chearfully obey, and maugre envy, ignorance and malice, ever appear

YOUR MAJESTY'S

Passionately-devoted, or
otherwise dis-interested
Subject and Servant,
WORCESTER.

To the Right Honourable

THE LORDS SPIRITUAL AND TEMPORAL;

And to the KNIGHTS, CITIZENS, AND BURGESSES of the Honourable House of Commons ; NOW assembled in Parliament.

My Lords and Gentlemen,

Be not startled if I address to all, and every of you, this Century of Summary Heads of wonderful things, even after the Dedication of them to His most Excellent Majesty, since it is with His most gracious and particular consent, as well as indeed no wayes derogating from my duty to His Sacred Self, but rather in further order unto it, since your Lordships, who are his great Council, and you, Gentlemen, His whole Kingdom's Representatives (most worthily welcome unto Him,) may fitly receive into your wise and serious considerations what doth or may publicly concern both His Majesty and His tenderly-beloved People.

Pardon me if I say (my Lords and Gentlemen) that it is joyntly your parts to digest to His hand these ensuing particulars, fitting them to His palate, and ordering how to reduce them into practice in a way useful and beneficial both to His Majesty and His Kingdom.

Neither do I esteem it less proper for me to present them to you, in order to His Majesty's service than it is to give

into the hands of a faithful and provident Steward whatsoever dainties and provisions are intended for the Master's diet; the knowing and faithful Steward being best able to make use thereof to his Master's contentment and greatest profit, keeping for the morrow what ever should be overplus or needless for the present day, or at least, to save something else in lieu thereof. In a word (my Lords and Gentlemen), I humbly conceive this *Simile* not improper, since you are His Majesty's provident Stewards, into whose hands I commit my self with all properties fit to obey you, that is to say, with a heart harbouring no ambition, but an endless aim to serve my King and Countrey: and if my endeavors prove effectual (as I am confident they will), his Majesty shall not onely become rich, but his people likewise, as Treasurers unto Him; and His Pierless Majesty, our King, shall become both belov'd at home and fear'd abroad, deeming the riches of a king to consist in the plenty enjoyed by His People.

And the way to render Him to be feared abroad is, to content his People at home, who then, with heart and hand, are ready to assist him; and whatsoever God blesseth me with to contribute towards the increase of His Revenues in any considerable way, I desire it may be employed to the use of His People; that is, for the taking off such Taxes or Burthens from them as they chiefly groane under, and by a Temporary necessity onely imposed upon them, which being thus supplied will certainly best content the King and satisfie His People, which I dare say is the continual Tend of all

your indefatigable pains, and the perfect demonstrations of your Zele to His Majesty, and an evidence that the Kingdoms Trust is justly and deservedly reposed in you. And if ever Parliament acquitted themselves thereof, it is this of yours, composed of most deserving and qualified Persons—qualified, I say, with your affection to your Prince, and with a tenderness to His People; with a bountiful heart towards Him, yet a frugality in their behalfs.

Go on, therefore, chearfully (my Lords and Gentlemen), and not onely our gracious King, but the King of Kings will reward you, the Prayers of the People will attend you, and His Majesty will, with thankful arms, embrace you. And be pleased to make use of me and my endeavors to enrich them, not my self; such being my onely request unto you, spare me not in what your Wisdoms shall find me useful, who do esteem myself not onely by the Act of the Water-commanding Engine (which so chearfully you have past), sufficiently rewarded, but likewise with courage enabled to do ten times more for the future; and my Debts being paid, and a competency to live according to my Birth and Quality settled, the rest shall I dedicate to the service of our King and Countrey by your disposals: and esteem me not the more or rather any more, by what is past, but what 's to come; professing really, from my heart, that my Intentions are to outgo the six or seven hundred thousand pounds already sacrificed, if countenanced and encouraged by you, ingenuously confessing that the melancholy which hath lately seized me, (the cause whereof none of

you but may easily guess,) hath, I dare say, retarded more advantages to the public service than modesty will permit me to utter: And now revived by your promising favors, I shall infallibly be enabled thereunto in the Experiments extant, and comprised under these heads practicable with my directions by the unparall'd workman, both for trust and skill, *Casper Kaltoff's* hand, who has been these five-and-thirty years as in a school, under me imployed, and still at my disposal, in a place by my great expences made fit for publick service, yet lately like to be taken from me, and consequently from the service of King and Kingdom, without the least regard of above ten thousand pounds expended by me, and through my Zele to the Common good; my Zele, I say, a field large enough for you (my Lords and Gentlemen) to work upon.

The Treasures buried under these heads, both for War, Peace, and Pleasure, being inexhaustible; I beseech you pardon me if I say so; it seems a Vanity, but comprehends a Truth; since no good Spring but becomes the more plentiful by how much more it is drawn, and the Spinner to weave his webb is never stinted but further inforc'd.

The more then that you shall be pleased to make use of my Inventions, the more Inventive shall you ever find me; one Invention begetting still another, and more and more improving my ability to serve my King and you; and as to my heartiness therein, there needs no addition, nor to my readiness a spur. And therefore (my Lords and Gentlemen) be pleased to begin, and desisist not from commanding me till I

flag in my obedience and endeavors to serve my King and Country.

*For certainly you'll find me breathless first t'expire,
Before my hands grow weary, or my legs do tire.*

Yet, abstracting from any Interest of my own, but as a Fellow-Subject and Compatriot, will I ever labor in the Vineyard, most heartily and readily obeying the least summons from you, by putting faithfully in execution what your Judgments shall think fit to pitch upon amongst this Century of Experiences, perhaps dearly purchased by me, but now frankly and *gratis* offered to you. Since my heart (methinks) cannot be satisfied in serving my King and Country, if it should cost them anything; As I confess, when I had the honor to be neare so obliging a Master as His late Majesty, of happy memory, who never refused me his Ear to any reasonable motion: And as for unreasonable ones, or such as were not fitting for him to grant, I would rather to have dyed a thousand deaths than ever to have made any one unto him.

Yet whatever I was so happy as to obtain for any deserving Person, my Pains, Breath and Interest employed therein, satisfied me not, unless I likewise satisfied the Fees; but that was in my Golden Age.

And even now, though my ability and means are shortened, the world knows why my heart remains still the same; and be you pleased, my Lords and Gentlemen, to rest most assured, that the very complacency that I shall

take in the executing your Commands shall be unto me a sufficient and an abundantly-satisfactory reward.

Vouchsafe therefore to dispose freely of me, and whatever lieth in my power to perform; first, in order to His Majesty's service; secondly, for the good and advantage of the Kingdom; thirdly, to all your satisfactions, for particular profit and pleasure to your individual selves, professing that in all and each of the three respects, I will ever demean my self as it best becomes,

My Lords and Gentlemen,

*Your most passionately-bent Fellow-Subject in
His Majesty's service, Compatriot for the
publick good and advantage, and a most
humble servant to all and every of you.*

WORCESTER.

A CENTURY

OF THE

*Names and Scantlings of
Inventions by me already
practised.*

1. Several sorts of Seals, some shewing by scrues, others by gages fastening or unfastening all the marks at once; others by additional points and imaginary places, proportionable to ordinary Escucheons¹ and Seals at Arms, each way palpably and punctually setting down (yet private from all others but the Owner and by his assent) the day of the Moneth, the day of the Week, the Moneth of the Year, the Year of our Lord, the names of the Witnesses, and the individual place where any thing was sealed, though in ten thousand several places, together with the very number of lines contained in a Contract, whereby falsification may be discovered and manifestly proved, being upon good grounds suspected.

Upon any of these Seals a man may keep Accompts of

¹ Escucheons.

Receipts and disbursements, from one Farthing to an hundred millions, punctually shewing each pound, shilling, penny, or farthing.

By these seals, likewise, any Letter, though written but in English, may be read and understood in eight several languages, and in English itself to clean contrary and different sense, unknown to any but the Correspondent, and not to be read or¹ understood by him neither, if opened before it arrive unto him; so that neither Threats nor hopes of Reward can make him reveal the secret, the Letter having been intercepted and first opened by the Enemy.

2. How ten thousand Persons may use these seals to all and every of the purposes aforesaid, and keep their secrets² from any but whom they please.

3. A Cypher and Character so contrived, that one line, without returns and³ circumflexes, stands for each and every of the 24. Letters; and as ready to be made for the one letter as the other.

4. This invention refined, and so abbreviated that a point onely sheweth distinctly and significantly any of the 24. letters; and these very points to be made with two pens, so that no time will be lost, but as one finger riseth the other may make the following letter, never clogging the memory with several figures for words and com-

¹ nor to be.

² secrets private.

³ or—for and.

bination of letters, which with ease, and void of confusion, are thus speedily and punctually, letter for letter, set down by naked and not multiplied points. And nothing can be less than a point, the Mathematical definition of² being, *Cujus pars nulla*. And of a motion no swifter imaginable then³ *Semiquavers* or *Releshes*, yet applicable to this manner of writing.

5. A way, by a Circular motion, either along a Rule or Ring-wise, to vary any Alphabet, even this of Points, so that the self-same Point, individually placed, without the least additional mark or variation of place, shall stand for all the 24. letters, and not for the same letter twice in ten sheets writing; yet as easily and certainly read and known as if it stood but for one and the self-same letter constantly signified.

6. How at a Window, far as Eye can discover⁴ black from white, a man may hold discourse with his Correspondent without noise made or notice taken; being, according to occasion given and means afforded, *Ex re nata*, and no need of Provision beforehand; though much better if foreseen, and means prepared for it, and a premeditated course taken by mutual consent of parties.

7. A way to do it by night as well as by day, though as dark as Pitch is black.

¹ combinations.

² of it.

³ than what expresseth even.

⁴ discern.

8. A way how to level and shoot Cannon by night as well as by day, and as directly; without a platform or measures taken by day, yet by a plain and infallible rule.

9. An Engine, portable in one's Pocket, which may be carried and fastened on the inside¹ of the greatest Ship, *Tanquam aliud agens*, and at any appointed minute, though a week after, either of day or night, it shall irrecoverably sink that Ship.

10. A way from a mile off to dive and fasten a like Engine to any Ship, so as it may punctually work the same effect either for time or execution.

11. How to prevent and safeguard any Ship from such an attempt by day or night.

12. A way to make a Ship not possible to be sunk, though shot an hundred times betwixt wind and water by Cannon, and should lose a whole Plank, yet in half an hours time, should be made as fit to sail as before.

13. How to make such false Decks, as in a moment should kill and take prisoners as many as should board the Ship, without blowing the Decks up or destroying them, from being reducible, and in a quarrer of an hours time should recover their former shape, and to be made fit for any imployment without discovering the secret.

14. How to bring a force to weigh up an Anchor, or to do any forcible exploit, in the narrowest or² lowest room in

¹ the side.

² and—for or.

any Ship, where few hands shall do the work of many; and many hands applicable to the same force, some standing, others sitting, and¹ by virtue of their several helps, a great force augmented in little room, as effectual as if there were sufficient space to go about with an Axle-tree, and work far from the Centre.

15. A way² how to make a Boat work it self against Wind and Tide, yea both without the help of man or beast; yet³ so that the Wind or Tide, though directly opposite, shall force the Ship or Boat against itself; and in no point of the Compass, but it shall be as effectual as if the wind were in the Pupp, or the stream actually with the course it is to steer, according to which the Oars shall row, and necessary motions work and move towards the desired Port or point of the Compass.

16. How to make a Sea-castle or Fortification Cannon proof, and capable of a thousand men, yet sailable at pleasure to defend a passage; or, in an hour's time, to divide itself into three Ships, as fit and trimmed to sail as before: And even whilst it is a Fort or Castle, they shall be unanimously steered, and effectually be driven by an indifferent strong wind.

17. How to make upon the *Thames* a floating Garden of

¹ and yet.

² a way—omitted.

³ but—for yet.

pleasure, with Trees, Flowers, Banqueting-Houses, and Fountains, Stews for all kinds of fishes, a reserve for Snow to keep Wine in, delicate Bathing places, and the like; with musick made with¹ Mills, and all in the midst of the stream where it is most rapid.

18. An Artificial Fountain, to be turned like an Hour-glass, by a child in the twinkling of an eye; it² holding a great quantity of water, and of force sufficient to make snow, ice, and thunder, with a³ chirping and singing of birds, and shewing of several shapes and effects usual to Fountains of pleasure.

16. A little engine within a Coach, whereby a child may stop it, and secure all persons within it, and the Coachman himself, though the horses be never so unruly⁴ in a full career; a child being sufficiently capable to loosen them in what posture soever they should have put themselves, turning never so short, for a child can do it in the twinkling of an eye.

20. How to bring up water Balance-wise, so that as little weight or force as will turn a Balance will be only needful, more then the weight of the water within the Buckets, which counterpoised,⁵ empty themselves one into

¹ by—for with.

² yet—for it.

³ the—for a.

⁴ and running.

⁵ counterpoise, and empty.

the other, the uppermost yielding its water, (how great a quantity soever it holds), at the self-same time the lower-most taketh it in, though it be an hundred fathom high.

21. How to raise water constantly with two Buckets onely day and night, without any other force then its own motion, using not so much as any force, wheel or sucker, nor more pulleys than one on which the cord or chain rolleth, with a bucket fastened at each end. This I confess¹ I have seen and learned² of the great Mathematician Claudius³ his studies at *Rome*, he having made a Present thereof unto a Cardinal; and I desire not to own any other mens⁴ inventions, but if I set down any, to nominate likewise the inventor.

22. To make a River in a Garden to ebbe and flow constantly, though twenty foot over, with a child's force, in some private room or place out of sight and a competent distance from it.

23. To set a Clock in⁵ a Castle, the water filling the⁶ Trenches about it⁷; it shall shew by ebbing and flowing, the Hours, Minutes, and Seconds and all the comprehensible

¹ confess to have.

² in the great Mathematician's study, Claudius at Rome.

³ Claudius.

⁴ man's.

⁵ as within a.

⁶ and the.

⁷ about it shall show the hours, minutes, and seconds by ebbing.

motions of the Heavens and Counterlibation¹ of the Earth according to *Copernicus*.

24. How to increase the strength of a Spring to such a height as to shoot Bumbasses and Bullets of an hundred pound weight a Steeple height, and a quarter of a mile off and more, Stone-bow-wise; admirable for Fire-works, and astonishing of besieged Cities, when, without warning given by noise, they find themselves so forcibly and dangerously surprised.

25. How to make a Weight that cannot take up an hundred pound and yet shall take up two hundred pound, and² at the self-same distance from the Centre; and so, proportionally, to millions of pounds.

26. To raise weight as³ well and as forcibly with the drawing back of the Lever, as with the thrusting it⁴ forwards; and by that means to lose no time in motion or strength. This I saw in the *Arcenal* at *Venice*.⁵

27. A way to remove to and fro huge weights with a most inconsiderable strength from place to place. For example, Ten Tunne with ten pounds, and less; the

¹ counterlibration.

² and—omitted.

³ so—for as.

⁴ of it.

⁵ at Venice in the Arsenal.

the said ten pounds not to fall lower than it makes the ten Tunne to advance or retreat upon a Level.

28. A Bridge, portable in¹ a Cart with six horses, which in a few hours time may be placed over a river half a mile broad, whereon with much expedition, may² be transported Horse, Foot and Cannon.

29. A portable Fortification able to contain five hundred fighting men, and yet³ in six hours time, may⁴ be set up and made Cannon-proof, upon the side of a River or Pass, with Cannon mounted upon it, and as complete as a regular Fortification, with Half-moons and Counterscarps.

30. A way in one nights time to raise a Bulwork twenty or thirty foot high, Cannon-proof, and Cannon mounted upon it, with men to over-look, command and batter a Towne; for though it contain but four Pieces, they shall be able to discharge two hundred Bullets each hour.

31. A way how safely and speedily to make an approach to a Castle or Town-wall, and over the very Ditch at Noon-day.

32. How to compose an universal Character methodical and easie to be written, yet intelligible in any Language; so that if an English-man write it in English, a French-man,⁵ Ita-

¹ upon.

² there may be.

yet omitted.

⁴ able to be.

⁵ man omitted.

lian, Spaniard, Irish,¹ Welsh, being Scholars; yea Grecian or Hebritian, shall as perfectly undertand it in their owne Tongue as if they were perfect English, distinguishing the Verbs from the Nouns, the Numbers, Tenses, and Cases, as properly expressed in their own Language as it was written in English.

33. To write with a Needle and Thred, white, or any color upon white or² any other³ color, so that one stitch shall significantly shew any letter, and as readily and as easily shew the one letter as the other, and fit for any Language.

34. To write by a knotted Silk string, so that every knot shall signifie any letter with Comma, Full point, or Interrogation, and as legible as with Pen and Ink upon white paper.

35. The like, by the fringe of Gloves.

36. By stringing of Bracelets.

37. By Pinck'd Gloves.

38. By holes in the bottom of a Sieve.

39. By a Lattin, or Plate Lanthorn.⁴

40. By the Smell.

41. By the Taste.

42. By the Touch.

¹ Irish and.

² or upon.

³ other *omitted*.

⁴ plate candlestick Lanthorn.

By these three Senses as perfectly distinctly and uncon-
fusedly, yea as readily as by the sight.

43. How to vary each of these, so that ten thousand may
know them, and yet¹ keep the understanding part from any
but their Correspondent.

44. To make a Key of a Chamber door, which to your
sight hath its Wards and Rose-pipe but Paper-thick, and yet
at pleasure in a minute of an hour, shall become a perfect
Pistol, capable to shoot through a Brest-plate commonly of
Carabine-proof, with Prime, Powder and Firelock, undis-
coverable in a strangers hand.

45. How to light a Fire and a Candle at what hour of the
night one awaketh, without rising or putting ones hand out
of the bed. And the same thing becomes² a serviceable
Pistol at pleasure; yet by a stranger, not knowing the secret,
seemeth but a dexterous Tinder-box.

46. How to make an artificial Bird to fly which way and
as long as one pleaseth, by or against the wind; sometimes
chirping, other times hovering, still tending the way it is de-
signed for.

47. To make a Ball of any metal, which thrown into a
Pool or Pail of water shall presently rise from the bottom,
and constantly shew by the *superficies* of the water the hour
of the day or night, never rising more out of the water then
just to the minute it sheweth of each quarter of the hour;

¹ yet omitted.

² becomes to be.

and if by force kept under water, yet the time is not lost, but recovered as soon as it is permitted to rise to the *superficies* of the water.

48. A scrued Ascent, instead of Stairs, with fit landing places to the best Chambers of each Story, with Back-stairs within the Noell of it, convenient for servants to pass up and down to the inward Rooms of them, unseen and private.

49. A portable Engine, in way of a Tobacco-tongs, whereby a man may get over a wall, or get up again being come down, finding the coast proving¹ unsecure unto him.

50. A complete light portable Ladder, which taken out of ones Pocket, may be by himself fastened an hundred foot high to get up by from the ground.

51. A Rule of Gradation, which with ease and method reduceth all things to a private correspondence, most useful for secret Intelligence.

51. How to signifie words and a perfect Discourse, by² jangling of³ Bells of any Parish-Church, or by any Musical Instrument within hearing, in a seeming way of tuning it; or of an unskilful beginner.

53. A way how to make hollow and cover a Water-scrue, as big and long as one pleaseth, in an easie and cheap way.

54. How to make a Water-scrue tite, and yet transparent, and free from breaking; but so clear, that one may palpably

¹ proveth.

² by the.

³ of the.

see the water or any heavy thing how and why it is mounted by turning.

55. A double Water-scrue, the innermost to mount the water, and the outermost for it to descend more in number of threds, and consequently in quantity of water, though much shorter than the innermost scrue, by which the water ascendeth, a most extraordinary help for the turning of the scrue to make the water rise.

56. To provide and make that all the Weights of the descending side of a Wheel shall be perpetually further from the Centre then those of the mounting side, and yet equal in number and heft to¹ the one side as the other. A most incredible thing, if not seen, but tried before the late King (of blessed memory)² in the *Tower*, by my directions, two Extraordinary Embassadors accompanying His Majesty, and the Duke of *Richmond* and Duke *Hamilton*, with³ most⁴ of the Court attending Him. The Wheel was 14. foot over, and 40. Weights of 50. pounds apiece. Sir *William Balfore*,⁵ then Lieutenant of the *Tower*,⁶ can justifie it, with several others. They all saw, that no sooner these great

¹ of *for* to.

² of happy and glorious.

³ and—*for* with.

⁴ most part.

⁵ Belford.

⁶ and yet liveing, can.

Weights passed the Diameter-line of the lower¹ side, but they hung a foot further from the Centre, nor no sooner passed the Diameter-line of the upper² side, but they hung a foot nearer. Be pleased to judge the consequence.

57. An ebbing and flowing Water-work in two Vessels, into either of which the water standing at a level, if a Globe be cast in, instead of rising it presently ebbeth, and so remaineth untill a like Globe be cast into the other Vessel, which the water is no sooner sensible of, but that³ Vessel presently ebbeth, and the other floweth, and so continueth ebbing and flowing untill one or both of⁴ the Globes be taken out, working some little effect besides its own motion; without the help of any man within sight or hearing: But if either of the Globes be taken out, with ever so swift or easie a motion, at the very instant the ebbing and flowing ceaseth; for if during the⁵ ebbing you take out the Globe, the water of that Vessel presently returneth to flow, and never ebbeth after, untill⁶ the Globe be returned into it, and then the motion beginneth as before.

58. How to make a Pistol to discharge a dozen times with

¹ upper.

² lower.

³ the

⁴ of—omitted.

⁵ that—for the.

⁶ unless—for untill.

one loading, and without so much as once new priming requisite, or to change it out of one hand into the other, or stop ones horse.

59. Another way as fast and¹ effectual, but more proper for Carabines.

60. A way with a Flask appropriated unto it, which will furnish either Pistol or Carabine with a dozen Charges in three minutes time, to do the whole execution of a dozen² shots, as soon as one pleaseth, proportionably.

61. A third way, and³ particular for Musquets, without taking them from their Rests to charge or prime, to a like execution, and as fast as the Flask, the Musquet containing but one Charge at a time.

62. A way for a Harquebuss, a Crock, or Ship-musquet, six upon a carriage, shooting with such expedition, as⁴ without danger one may charge, level, and discharge⁵ them sixty times in a minute of an hour, two or three together.

63. A sixth way,⁶ most excellent for Sakers, differing from the other, yet as swift.

64. A seventh, tried and approved before the late King

¹ and as

² of 12.

³ and—*omitted*.

⁴ as that.

⁵ level and discharge—*omitted*.

⁶ way—*omitted*.

(of ever blessed memory) and an hundred Lords and Commons, in a Cannon of 8. inches half quarter, to shoot bullets of 64. pounds weight, and 24. pounds of powder, twenty times in six minutes ; so clear from danger, that after all were discharged, a Pound of Butter did not melt, being laid upon the Cannon-britch, nor the green Oile discoloured that was first anointed¹ and used between the Barrel thereof, and the Engine, having never in it nor within six foot but one charge at a time.

65. A way that one man in the Cabin may govern the² whole side of Ship-musquets, to the number (if need require) of 2. or 3000. shots.

66. A way that against³ several Advenues to a Fort or Castle, one man may charge fifty Cannons playing, and stopping when he pleaseth, though out of sight of the Cannon.

67. A rare way, likewise, for musquetoons fastened to the Pummel of the Saddle, so that a Common Trooper cannot misse to charge them with twenty or thirty bullets at a time, even in full career.

When first I gave my thoughts to make Guns shoot often, I thought there had been but one only exquisite way inventible, yet by several trials and much charge, I have perfectly tried all these.

¹ it and.

² a—for the.

³ against the.

68. An admirable and most forcible way to drive up water by¹ fire, not by drawing or sucking it upwards, for that must be as the philosopher calleth it, *Intra² sphaeram activitatis*, which is but at such a distance. But this way hath no Bounder, if the Vessels be strong enough; for I have taken a piece of a whole Cannon, whereof the end was burst, and filled it three quarters full of water,³ stopping and scruing up the⁴ broken end; as also the Touch-hole; and making a constant fire under it, within 24. hours it burst and made a great crack: So that having a way⁵ to make my Vessels, so that they are strengthened by the force within them, and the one to fill after the other. I have seen the water run⁶ like a constant Fountaine-stream, 40. foot high; one Vessel of water rarified by fire, driveth up 40.⁷ of cold water. And a man that tends the work is but to turn two Cocks, that one Vessel of water being consumed, another begins to force and⁸ refill with cold water, and so successively, the fire being tended and kept constant, which the self-same Person may likewise

¹ with—for by.

² *infra*.

³ of water omitted.

⁴ that—for the.

⁵ found a way.

⁶ to run.

⁷ driving 40. of.

⁸ and that to re-fill.

abundantly perform in the interim between the necessity of¹ turning the said Cocks.

69. A way how a little triangle² scrued Key, not weighing a Shilling³, shall be capable and strong enough to bolt and unbolt, round about a great Chest, an hundred Bolts through fifty Staples, two in each, with a direct contrary motion, and as many more from both sides and ends; and at the self-same time shall fasten it to a place, beyond a mans natural strength to take it away: and in one and the same turn both locketh and openeth it.

70. A Key with a Rose-turning pipe, and two Roses pierced through endwise the Bit thereof,⁴ with several handsomly-contriv'd Wards, which may likewise do the same effects⁵.

71. A key perfectly square, with a Scrue turning within it and more conceited then any of the rest,⁶ and no heavier than the triangle-scrued Key, and doth the same effects.

72. An Escoccheon⁷ to be placed before any of these Locks, with these properties:

¹ necessity of *omitted*.

² triangle and.

³ not weighing a shilling *omitted*.

⁴ together—for thereof.

⁵ effect.

⁶ other—for rest.

⁷ Schuchlon.

1. The owner (though a woman) may with her delicate hand, vary the wayes of coming to open the Lock ten millions of times, beyond the knowledge of the Smith that made it, or of me who invented it.

2. If a stranger open it, it setteth an Alarm a-going, which the stranger cannot stop from running out; and besides, though none should be within hearing, yet it catcheth his hand as a Trap doth a Fox; and though far from maiming him, yet it leaveth such a mark behind it, as will discover him if suspected; the Escoccheon¹ or² Lock plainly shewing what monies he hath taken out of the Box to a farthing, and how many times opened since the owner hath been in it.³

73. A transmittible Gallery over any Ditch or Breach in a Town-wall, with a Blinde and Parapit Cannon-proof.

74. A Door, whereof the turning of a Key, with the help and motion of the handle, makes the hinges to be of either side, and to open either inward or outward, as one is to enter or to⁴ go out, or to open in half.

75. How a Tape or Ribbon-weaver may set down a whole discourse, without knowing a letter, or interweaving any thing suspicious of other secret than a new-fashioned Ribbon.

¹ Scuchlon.

² or the.

³ at it.

⁴ to omitted.

76. How to write in the dark as streight as by day or candle-light.

77. How to make a man to fly ; which I have tried with a little Boy of ten years old in a Barn, from one end to the other, on a Hay-mow.

78. A Watch to go constantly, and yet needs no other winding from the first setting on the Cord or Chain, unless it be broken, requiring no other care from one then to be now and then consulted with concerning the hour of the day or night ; and if it be laid by a week together, it will not erre much, but the oftener looked upon the more exact it sheweth the time of the day or night.

76. A way to to lock all the Boxes of a Cabinet, (though never so many) at one time, which were by particular Keys, appropriated to each Lock, opened severally and independent the¹ one of the other, as much as concerneth the opening of them, and by these² means cannot be left opened un-awares.

80. How to make a Pistol Barrel no thicker then a Shilling, and yet able to endure a Musquet proof of Powder and Bullet.

81. A Combe-conveyance carrying of³ Letters without suspicion, the head being opened with a Needle-scrue draw-

¹ the omitted.

² this—for these.

³ of omitted.

ing a Spring towards them¹, the Comb being made but after an usual form carried in ones Pocket.

82. A Knife Spoon, or Fork in an usual portable Case, may have the like conveyances in their handles.

83. A Rasping-mill, for Harts-horn, whereby a child may do the work of half a dozen men, commonly taken up with that work.

84. An Instrument whereby persons² ignorant in Arithmetic may perfectly observe Numerations³ and Subtractions³ of all Summes and Fractions.

85. A little Ball made in the shape of a Plum or Pear, being⁴ dexterously conveyed or forced into a bodies mouth, shall presently shoot forth such and so many Bolts of each side and at both ends, as⁵ without the owners Key, can neither be opened or⁶ filed off, being made of tempered Steel, and as effectually locked as an Iron Chest.

86. A chair, made *a-la-mode*, and yet a stranger being perswaded to set in't, shall have immediately his armes and thighs lock'd up beyond his own power to loosen them.

87. A Brass mould to cast Candles, in which a man may

¹ one—for them,

² a person,

³ numeration and subtraction.

⁴ which being.

⁵ as that.

⁶ nor.

make 500. dozen in a day, and adde an ingredient to the tallow which will make it cheaper, and yet so that the Candles shall look whiter and last longer.

88. ¹How to make a Brazen or Stone head, in the midst of a great Field or Garden, so artificial and natural, that though a man speak never so softly, and even whispers into the ear thereof, it will presently open its mouth, and resolve the Question in French, Latine, Welsh, Irish or English, in good terms uttering it out of his mouth, and then shut it untill the next Question be asked.

89. White Silk, knotted in the fingers² of a Pair of white Gloves, and so contrived without suspicion, that playing at *primero*, at cards, one may without clogging his memory keep reckoning of all Sixes, Sevens and Aces, which he hath discarded.³

90. A most dexterous Dicing Box, with holes transparent, after the usual fashion, with a Device so dexterous, that with a knock of it against the Table the four good Dice are fastened, and it⁴ looseneth four false Dice made fit for his purpose.

91. An artificial Horse, with Saddle and Caparizons fit

¹An engine without ye least noyse, knock, or use of fyre, to coyne and stamp 100. lb. in an houre by one man.

²finger.

³without foul play.

⁴it omitted.

for running at¹ the ring, on which a man being mounted, with his Lance in his hand, he can at pleasure make him start, and swiftly to run his career, using the decent posture² with *bon grace*, may take the Ring as handsomly and running as swiftly as if he rode upon a Barbe.

92. A scrue, made like a Water-scrue, but the bottom made of Iron-plate Spade wise, which at the side of a Boat, emptieth the mud of a Pond, or raiseth Gravel.

93. An Engine whereby one man may take out of the water a Ship of 500. Tun, so that it may be calked, trimmed and repaired, without need of the usual way of stocks, and as easily let it down again.

94. A little Engine portable in ones Pocket, which placed to any door, without any noise, but one crack, openeth any door or gate.

95. A double Cross-bow, neate, handsome, and strong, to shoot two Arrows, either together, or one after the other, so immediately, that a Deer cannot run two steps, but, if he miss³ of one Arrow, he may be reach'd with the other, whether the Deer run forward, sideward, or start backward.

96. A way to make a Sea-bank so firm and Geometrically-strong, that a stream can have no power over it; excellent, likewise, to save the Pillar of a Bridge, being far cheaper and stronger then Stone-walls.

¹ at omitted.

² postures.

³ be missed.

97. An Instrument whereby an ignorant person may take any thing in Perspective, as justly, and more than the skilfullest Painter can do by his eye.

98. An Engine, so contrived, that working the *Primum mobile* forward or backward, upward or downward,¹ circularly or corner-wise, to and fro, streight, upright or downright, yet the pretended Operation continueth, and advanceth none of the motions above-mentioned, hindering, much less stopping, the other; but unanimously, and with harmony agreeing they all augment and contribute strength unto the intended work and operation: and, therefore, I call this a *Semi-omnipotent Engine*, and do intend that a Model thereof be buried with me.

99. How to make one pound weight to raise an hundred as high as one pound falleth, and yet the hundred pound descending doth² what nothing less than one hundred pound can effect.

100. Upon so potent a help as these two last-mentioned Inventions a Water-work is, by many years experience³ and labour, so advantageously by me⁴ contrived, that a Child's force bringeth up an hundred foot high an incredible quan-

¹ forwards or backwards, upwards or downwards.

² to do.

³ expences—for experience.

⁴ by me—omitted.

tity of water, even two foot Diameter, so naturally, that the work will not be heard even into the next Room; and with so great ease and Geometrical Symmetry, that though it work day and night from one end of the year to the other, it will not require forty shillings reparation to the whole Engine, nor hinder ones day-work¹. And I may boldly call it *The most stupendous work in the whole world*: not onely with little charge, to drein all sorts of Mines, and furnish Cities with water, though never so high seated, as well to keep them sweet, running through several streets, and so performing the work of Scavengers, as well as furnishing the inhabitants with sufficient water for their private occasions; but likewise supplying rivers with sufficient to maintaine and make them portable² from Towne to Towne, and for the bettering of Lands all the way it runs; with many more advantageous, and yet greater effects of Profit, Admiration, and Consequence. So that deservedly I deem this Invention to crown my Labors, to reward my Expences, and make my Thoughts acquiesce in way of further Inventions: This making up the whole Century, and preventing any further trouble to the Reader for the present, meaning to leave to Posterity a Book, wherein under each of these Heads the means to put in execution and visible trial all and every of these Inventions, with the shape

¹ The sentence beginning "so naturally" and ending "ones day-work," is not found in the MS. copy.

² make navigable—for make them portable.

and form of all things belonging to them, shall be Printed by Brass-plates.

In Bonum Publicum,

et

*Ad Majorem DEI Gloriam.*¹

The following passage, added as a postscript to the MS., does not appear in the edition of 1663 :

¹ “ Besydes many omitted, and some of three sorts willingly not set downe, as not fitt to be divulged, least ill use may bee made thereof; butt to shew that such things are also within my knowledge, I will here in myne own cypher set down one of each, not to be concealed when duty and affection oblgeth me.”

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¹ "Index."

² "A *mute* yet perfect discourse, as far distant as eye can reach by day to discern colors."

³ "Though never soe darke."

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² *For weights*—wanting in the MS.

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¹ and each of these—wanting.

² Forsacres.

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¹ "For whole cannon."

² *a whole side of*—wanting.

³ *or ribbon*—wanting.

⁴ "A continual watch."

⁵ *A total*—wanting.

⁶ "81. 82. Conveyance for letters."

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¹ Wanting entirely in the MS.

² "Stamping engine."

³ "Primero gloves." The Marquis seems to have been in doubt which he should erase—the brazen head or the dicing-box.

⁴ Wanting in the MS.

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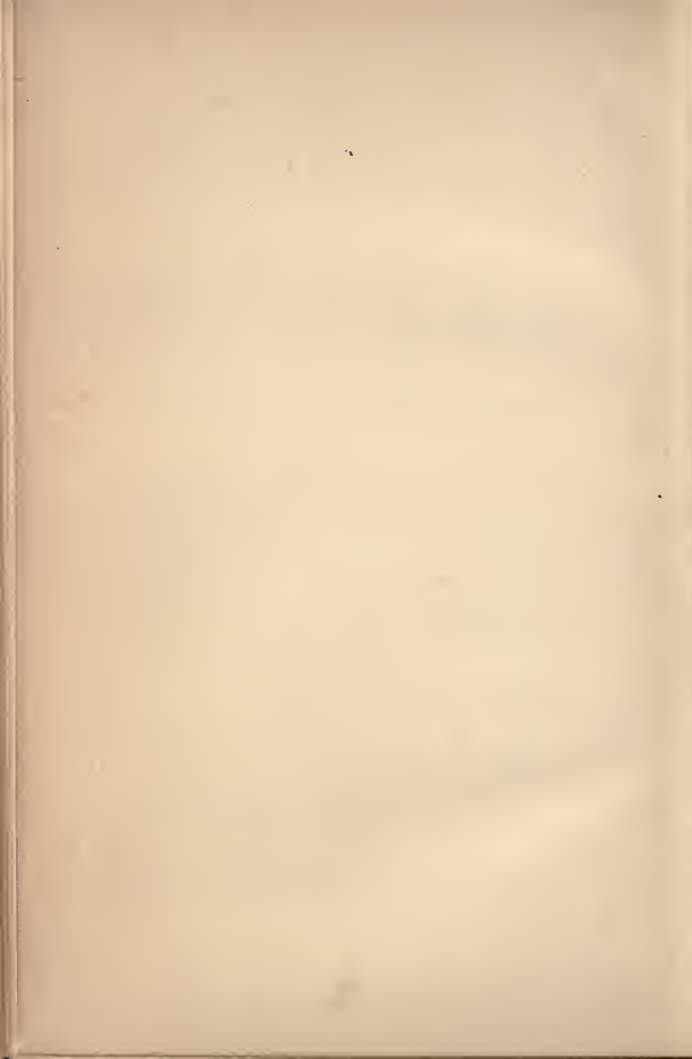


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